Artificial Intelligence Congregates with the Human Mind at the Prefrontal Cortex

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The paper by Dr. James A. Crowder, Shelli Friess, MA, NCC, and their team at Raytheon Intelligence and Information Systems presents a novel framework for enhancing artificial intelligence systems with a form of artificial consciousness. This framework, referred to as the Artificial Cognitive Neural Framework (ACNF), is designed to facilitate "conscious" software agents within AI processing environments. These agents are autonomous, capable of sensing their environment, and acting upon it with a degree of autonomy that allows for evolution and adaptation over time.

Key findings and components of the ACNF include:

Artificial Prefrontal Cortex (APC): The APC is central to the framework, providing AI systems with cognitive intelligence capabilities such as rapid analysis, reasoning, and reporting. It integrates information, intelligence, and memory across the system, enhancing the AI's adaptability and knowledge delivery.

Conscious Software Agents: These agents are embedded within the AI processing environment, possessing the ability to evolve, sense changes, and adapt their actions based on evolving constraints. They embody cognitive abilities including concept formation, basic emotions, and short & long-term memory functionalities.

Cognitive States and Transitions: The framework models cognitive states within the APC, enabling transitions between these states based on "possibilistic" parameters that evolve through learning algorithms. This feature allows for executive-level planning and adaptation to changing environments.

Fuzzy, Self-Organizing, Contextual Topical Maps (FSOCTM): The ACNF uses these maps for analyzing and visualizing complex, multi-dimensional sensory information. This aids in the organization of information semantically into categories or topics, enhancing the system's understanding and processing capabilities.

Dialectic Search: Utilizing the Toulmin Argument Structure, this component allows the APC to develop cognitive inferences and arguments by relating information and memories to hypotheses. This mimics human reasoning and enhances the AI's ability to process diverse information.

Executive Functions and Mindfulness: The framework aims to endow AI systems with executive function abilities, such as goal definition, outcome prediction, and strategic behavior planning. This includes the cognitive concept of "mindfulness," where the AI can perceive and interpret information without distortion or judgment.

The ACNF represents a significant step towards creating AI systems with more autonomous, adaptable, and "conscious" capabilities, potentially leading to applications in various domains such as UAVs, intelligence processing, and cybersecurity systems.

The paper emphasizes the integration of artificial intelligence (AI) capabilities within the framework of an Artificial Prefrontal Cortex (APC). **The APC is designed to mimic the functions of the human prefrontal cortex, which is essential for cognitive control, decision-making, and orchestrating thoughts and actions in accordance with internal goals. To put it differently, emphasize artificial intelligence merging at the prefrontal cortex.**

The APC in this context serves as the cognitive center of the AI system, providing it with advanced functionalities such as:

- Cognitive Intelligence: Enabling rapid analysis, reasoning, and reporting capabilities akin to human cognitive processes.
- Executive Functions: Facilitating complex decision-making, planning, and the moderation of social behavior, mirroring the executive functions attributed to the human prefrontal cortex.
- Integration of Information and Memory: Allowing the AI system to integrate and utilize information and memories across its processing environment, enhancing its adaptability and response to changing conditions.

By merging AI with an artificial model of the prefrontal cortex, the authors aim to create more sophisticated, autonomous AI systems capable of "conscious" behaviors, where the AI can make decisions, adapt to new situations, and potentially exhibit a form of mindfulness, all of which are influenced by the advanced cognitive capabilities provided by the APC.

https://www.researchgate.net/publication/235219077_The_Artificial_Prefrontal_Cortex_Artificial_Consciousness